

Exercise 18.1

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Question 1: Find the lateral surface area and total surface area of a cuboid of length 80 cm, breadth 40 cm and height 20 cm.

Solution:

Given, Dimensions of a cuboid:

Length (l) = 80 cm

Breadth (b) = 40 cm

Height (h) = 20 cm

We know that, Total Surface Area = $2[lb + bh + hl]$

By substituting the values, we get

$$= 2[(80)(40) + (40)(20) + (20)(80)]$$

$$= 2[3200 + 800 + 1600]$$

$$= 2[5600]$$

$$= 11200$$

Therefore, Total Surface Area = 11200 cm^2

Now,

Lateral Surface Area = $2[l + b]h$

$$= 2[80 + 40]20$$

$$= 40[120]$$

$$= 4800$$

Thus, Lateral Surface Area is 4800 cm^2 .

Question 2: Find the lateral surface area and total surface area of a cube of edge 10 cm.

Solution:

Side of a Cube = 10 cm (Given)

Formula for Cube Lateral Surface Area = 4 side^2

$$\text{Cube Lateral Surface Area} = 4(10 \times 10)$$

$$= 400 \text{ cm}^2$$

Total Surface Area = 6 Side^2

$$= 6(10^2)$$

$$= 600 \text{ cm}^2$$

Question 3: Find the ratio of the total surface area and lateral surface area of a cube.

Solution:

Total Surface Area of the Cube (TSA) = 6 Side^2

Lateral surface area of the Cube (LSA) = 4 Side^2

Now,

Ratio of TSA and LSA = $(6 \text{ Side}^2) / (4 \text{ Side}^2) = 3/2$ or 3:2.

Question 4: Mary wants to decorate her Christmas tree. She wants to place the tree on a wooden block covered with colored paper with a picture of Santa Claus on it. She must know the exact quantity of paper to buy for this purpose. If the box has length, breadth, and height as 80 cm, 40 cm and 20 cm respectively. How many square sheets of paper of side 40 cm would she require?

Solution:

The dimensions of the wooden block are:

Length (l) = 80cm

Breadth (b) = 40cm

Height (h) = 20cm

Surface Area of the wooden box = $2[lb + bh + hl]$

$$= 2[(80 \times 40) + (40 \times 20) + (20 \times 80)]$$

$$= 2[5600]$$

$$= 11200$$

Surface Area of the wooden box is 11200 cm^2

The Area of each sheet of the paper = $40 \times 40 \text{ cm}^2 = 1600 \text{ cm}^2$

Now,

The total number of sheets required = $(\text{Surface area of the box}) / (\text{Area of one sheet of paper})$

$$= 11200/1600$$

$$= 7$$

Therefore, Marry would require 7 sheets. Answer!!

Question 5: The length, breadth, and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of Rs 7.50 m².

Solution:

Formula: Total Area to be washed = $lb + 2(l + b)h$ (1)

Where, l = length , b = breadth and h = height.

From given:

Length = $l = 5 \text{ m}$

Breadth = $b = 4 \text{ m}$

Height = $h = 3 \text{ m}$

Total area to be white washed = $(5 \times 4) + 2(5 + 4)3$
(using (1))

$$= 74$$

Total area to be white washed is 74 m^2

Now, cost of white washing 1 m^2 is Rs. 7.50 (Given)

Therefore, the cost of white washing $74 \text{ m}^2 = (74 \times 7.50)$

$$= \text{Rs. } 555$$

Question 6: Three equal cubes are placed adjacently in a row. Find the ratio of a total surface area of the new cuboid to that of the sum of the surface areas of the three cubes.

Solution:

Let breadth of the cuboid = a

Then, length of the new cuboid = 3a and

Height of the new cuboid = a

Now,

Total surface area of the new cuboid (TSA) = $2(lb+bh+hl)$

$$= 2(3a \times a + a \times a + a \times 3a)$$

$$= 14a^2$$

Again,

Total Surface area of three cubes = $3 \times (6 \text{ side}^2)$

$$= 3 \times 6a^2$$

$$= 18a^2$$

Therefore, ratio of a total surface area of the new cuboid to that of the sum of the surface areas of the three cubes = $14a^2/18a^2 = 7/9$ or 7:9

Therefore, required ratio is 7:9. Answer.

Question 7: A 4 cm cube is cut into 1 cm cubes. Calculate the total surface area of all the small cubes.

Solution:

Edge of the cube = 4 cm (Given)

$$\text{Volume of the cube} = \text{Side}^3 = 4^3 = 64$$

Volume of the cube is 64cm^3

Again,

Edge of the cube = 1cm^3

$$\text{So, Total number of small cubes} = 64\text{cm}^3/1\text{cm}^3 = 64$$

$$\text{And, total surface area of all the cubes} = 64 \times 6 \times 1 = 384\text{ cm}^2$$

Question 8: The length of a hall is 18 m and the width 12 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height of the hall.

Solution:

Dimensions of the hall are:

Length = 18m

Width = 12m

From statement:

Area of the floor and the flat roof = Sum of the areas of four walls ...(1)

Using respective formulas and given values, we have

Area of the floor and the flat roof = $2lb = 2 \times 18 \times 12 = 432$ sq/ft ...(2)

Sum of the areas of four walls = $(2 \times 18h + 2 \times 12h)$ sq/ft ...(3)

Using equation (2) and (3) in (1), we get

$$432 = 2 \times 18h + 2 \times 12h$$

$$18h + 12h = 216$$

$$\text{or } h = 7.2$$

Therefore, height of the hall is 7.2 m.

Question 9: Hameed has built a cubical water tank with lid for his house, with each other edge 1.5 m long. He gets the outer surface of the tank excluding the base, covered with square tiles of side 25 cm. Find how much he would spend for the tiles if the cost of tiles is Rs 360 per dozen.

Solution:

Edge of the cubical tank = 1.5m or 150 cm

Surface area of the cubical tank (5 faces) = 5 x Area of one Face

$$= 5 \times (150 \times 150) \text{ cm}^2 \dots\dots(1)$$

Find area of each square tile:

Side of tile = 25 cm (given)

$$\text{Area of one tile} = 25 \times 25 \text{ cm}^2 \dots\dots(2)$$

Now,

Number of tiles required = (Surface Area of Tank) / (Area of each Tile)

$$= (5 \times 150 \times 150) / 25 \times 25$$

$$= 180$$

Find cost of tiles:

Cost of 1 dozen tiles, i.e., cost of 12 tiles = Rs. 360

Therefore, cost of one tile = Rs. 360/12 = Rs. 30

So, the cost of 180 tiles = 180 x 30 = Rs. 5400

Question 10: Each edge of a cube is increased by 50%. Find the percentage increase in the surface area of the cube.

Solution:

Let 'a' be the edge of a cube.

Surface area of the cube having edge 'a' = $6a^2$ (1)

As given, a new edge after increasing existing edge by 50%, we get

The new edge = $a + 50a/100$

$$= 3a/2$$

Surface area of the cube having edge ' $3a/2$ ' = $6 \times (3a/2)^2 = (27/2) a^2$ (2)

Subtract equation (1) from (2) to find the increase in the Surface Area:

$$\text{Increase in the Surface Area} = (27/2) a^2 - 6a^2$$

$$= (15/2)a^2$$

Now,

$$\text{Percentage increase in the surface area} = \left(\frac{(15/2)a^2}{6a^2} \right) \times 100$$

$$= 15/12 \times 100$$

$$= 125\%$$

Therefore, percentage increase in the surface area of a cube is 125.